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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,007	12/15/2003	Christopher Laurent Beaudry	8034 USA L/W-C/W-C/JB1	2960

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EXAMINER	
DEO, DUY VU NGUYEN	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 08/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/736,007	BEAUDRY ET AL.	
	Examiner	Art Unit	
	DuyVu n. Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-62* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *37-50 and 59-62* is/are allowed.

6)☒ Claim(s) *1-25,32-36 and 51-58* is/are rejected.

7)☒ Claim(s) *26-31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/15/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5, 12, 15, 19, 23, 25, 32-34, 51, 54, 57 are rejected under 35 U.S.C. 102(e) as being anticipated by Boyers (US 2003/0051742).

Boyers describes a method for treating a substrate comprising: dispensing a liquid onto a topside of a horizontally spinning 300 mm wafer from a single dispense centered approximately over the wafer (fig. 1; paragraph [0014]) with a spinning rate of 1000-4000 rpm and a flow rate of 2.7 L/min (this combination would be above a curved defined by the 3 set points cited in claim 1) (paragraph [0020]).

Referring to claims 2 and 3, the method cleans photoresist, post ash photoresist residue, post-etch residue, and other organic materials from the semiconductor wafers (paragraph [0007]). The topside of these wafers would be either hydrophobic.

Referring to claims 12, 15, the liquid includes etch and rinse solutions and they are dispensed concurrently a portion of the cycle (paragraph [0026]). This would read on claimed stopping the dispense of the 1st liquid while continue dispensing the second liquid. Referring to claim 23, this would result in changing the etch solution's pH to a second pH since it is mixed with the rinse. Since the wafer is spinning during the whole time at about the same rate (table 1)

the wafer would have a first, second, and third spin rate for the transition from the etch, etch/rinse, and rinse solutions. Also the same spin rate would also minimize the turbulence in the liquid layer.

Referring to claim 25, the second pH would approximately 7 since the rinse is DI water, which has a neutral pH.

Referring to claim 19, the liquid further comprises of surfactant (paragraph [0028]).

Referring to claims 32, the liquid layer would have a sufficient thickness of 0.5-3 mm or approximately 1 mm to prevent the deposition of particles onto the topside of the wafer since the liquid is dispensed at a similar flow and wafer spin rate and it is used to etch and clean the particles or residues.

Referring to claim 51, the etch/clean solution has a first concentration of etchants and capable of etching at a first etch rate producing a first amount of etch products (paragraph [0022], table 1); by adding DI water, it would modify the etch/cleaning solution, which would has a second lower etch rate than the first etch rate since the etch/cleaning solution is diluted. This would also change the pH (claimed pH transition) of the cleaning solution. Since the liquid is used to etch/clean the wafer, the cleaning solution would has a second amount of etch products to prevent the formation of particle defects on the wafer surface (paragraph [0026]).

Referring to claims 54, 57 the mixture of etch/cleaning and DI water would read on claimed second solution and it would have a concentration of etchants lower than the first concentration since it is diluted with DI water.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 6, 7, 13, 14, 20, 22, 24, 52, 53, 55, 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boyers.

Referring to claims 6, 7, 20, 24 Boyers doesn't describe the flow rate and the spin rate as that of the claims and the pH at 9-10. However, his flow rate and spin rate of the liquid would include those of the claimed rates (table 1). One skilled in the art would find it obvious to determine the flow and spin rate, and the pH through routine experimentation because Boyers teaches that different spin rate can be chosen for different portions of the processing cycle and the other process conditions outside the presented ranges can be used for different applications and wafer configurations (paragraphs [0013, 0023]).

Referring to claims 13, 14, 52, 53, 55, 56, the time to dispense the second liquid and the first liquid concurrently, the second etch rate, and the concentration of the etchants of the second solution would be obvious to be determined through routine experimentation in order to provide optimum transition time, concentration, and etch rate to clean the wafer with a reasonable expectation of success.

5. Claims 8, 17, 18, 21, 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boyers as applied to claims 1, 20, and 51 above, and further in view of Zhang et al. (US 2004/0029395).

Unlike claimed invention, Boyers doesn't describe the liquid is a modified SC-1 cleaning solution comprising NH4OH, H2O2, water, a chelating agent, and a surfactant. Zhang teaches a cleaning solution comprising NH4OH, H2O2, water, a chelating agent, and a surfactant, and ozone (paragraph [0042]). It would have been obvious for one skilled in the art to modify Boyers' solution in light of Zhang because Zhang teaches that his solution would remove particulates that may lead to defects through dispersion (paragraphs [0028,0029]).

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Boyers as applied to claim 12 above, and further in view of admitted prior art.

Referring to claim 16, it is known to one skilled in the art to further applying a HF solution preceding the cleaning. Therefore, one skilled in the art would find it obvious to modify Boyers to apply HF solution in order to etch or remove the oxide (page 2 of the specification).

7. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boyers as applied to claim 1 above, and further in view of Farber et al. (US 2001/0047810).

Referring to claim 9, Boyers is silent about dispensing the liquid in a sweeping dispense toward an edge of the wafer. Farber describes a method for cleaning a wafer wherein the liquid is dispensed in a sweeping dispense from the center toward an edge of the wafer (paragraph [0020]). It would have been obvious for one skilled in the art to modify Boyers' method in light of Farber's teaching because sweeping dispense from the center toward the edge of the wafer would distribute the cleaning solution more evenly through out the wafer.

Referring to claims 10 and 11, as the process comes to an end, the wafer spin rate would decrease. This would occur simultaneously to the dispensing of the liquid in the sweeping dispense as it also comes to a stop.

8. Claims 35, 36 rejected under 35 U.S.C. 103(a) as being unpatentable over Boyers as applied to claim 23 above, and further in view of Bergman (US 2004/022877).

Unlike claimed invention, Boyers doesn't suggest to heat the wafer a T of 20-90 degree Celsius, which is greater than that of the liquid layer. Bergman teaches for treating a wafer with a liquid wherein an UV or infrared lamp is used to heat the wafer (paragraph [0065]). This would make the wafer temperature greater than that of the liquid layer since the wafer T would be at the liquid T before the heating. It would have been obvious for one skilled in the art to modify Boyers' method in light of Bergman because he teaches that this would enhances the chemical reactions and speeds up processing (paragraph [0065]). According to the combining method of Boyers and Bergman, the wafer T would be in the claimed ranged since Boyers shows the liquid T is at least 20 degree Celsius (tables 1, 2).

Allowable Subject Matter

9. Claims 26-31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 26-28 are allowable because applied prior art doesn't teach or suggest minimizing turbulence within the liquid layer during the transition comprises keeping the second spin rate below 500 rpm, or 200 rpm, or 50 rpm.

Claims 29-31 are allowable because applied prior art doesn't teach or suggest minimizing turbulence within the liquid layer during the transition comprises change the first spin rate to a second spin rate a rate of less than 100 rpm/second, or 50 rpm/second, or 5 rpm/second.

Claims 59-62 are allowed because applied prior art doesn't teach or suggest the limitations of claim 59.

Claims 37-50 are allowed because applied prior art doesn't suggest replacing the first liquid at a second T and second pH with a second liquid, the second liquid having a third T substantially equal to the second T and a pH substantially lower than the second pH to prevent an agglomeration of a plurality of etched species.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 55 and 56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation "the second solution has a second concentration in..." it is unclear what concentration the limitation is referring to.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-2:30 Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Primary Examiner
Duy-Vu N. Deo
8/17/05